Docket #: Vaugha.B-05

APPLICATION

Of

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For

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On

REMOTE-CONTROLLED VEHICLE LOW-POWER INDICATOR AND METHOD OF USE

Sheets of Drawings: eight (8)

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TITLE: Remote-Controlled Vehicle Low-Power Indicator and Method of Use

BACKGROUND OF THE INVENTION

INCORPORATION BY REFERENCE:

Applicant hereby incorporates herein by reference, any and all U. S. patents, U.S. patent applications, and other documents and printed matter cited or referred to in this application.

FIELD OF THE INVENTION:

This invention relates generally to low-power indicators, and more particularly to a remote-control vehicle low-power indicator.

DESCRIPTION OF RELATED ART:

The following art defines the present state of this field:

Epstein et al., U.S. 5,053,753 describes a low battery level indicator for a smoke detector. When the battery in the smoke detector becomes so weak that its voltage drops below a pre-determined value, an elongated, flexible signal member such as a tape or cord is released from the smoke detector so that it hangs down into the room below to persistently remind the occupant to replace the battery with a fresh one. The elongated signal member can be used together with a conventional device, which emits audible periodic beeps or has a periodically flashing light to indicate the low battery condition. However, the long flexible signal member continues to hang down and remind the occupant that the battery must be replaced, even after the battery has gone completely dead and the horn and lamp no longer function. This invention constitutes a potential life-saving device.

Reimers, U.S. 5,180,023 describes a self propelled golf bag cart assembly that allows a golfer to walk during a round of golf while having the golf cart and the contents carried by the cart. The bag cart includes a plurality of cooperative subassemblies for performing specific functions. The bag cart includes a frame subassembly, a first drive wheel subassembly, a second drive wheel subassembly, a caster subassembly, a handle subassembly, and a handgrip subassembly. Each of the drive wheel subassemblies includes a shoulder, a motor, and a wheel subassembly. Power and control is provided by directly driving a motor associated with each wheel through an electrical subassembly. The electrical subassembly includes a battery and a variety of controlling components situated in a manual control box, a main power unit the handgrip, and an optional remote control unit. The bag cart is primarily characterized by direct independent drive of the wheels, compactiblity from a use mode to a storage mode, and precise user control from the handgrip, or the remote control unit. The primary expected usage of the self- propelled golf bag cart assembly is by individual golfers on walking courses.

Huey, Jr. et al., U.S. 5,594,422 describes a wall-mounted stand-alone smoke detector having an elongated housing. The housing has two ends. One end forms a base. The other end houses a sensor head remote from the base. A rigid member supports the sensor and connects the sensor to the base. The sensor head has a smoke sensor, a signal conditioner and a preamplifier for respectively detecting, conditioning, amplifying and providing signals from the sensor to a signal processor in the base. A positioning probe is attached to the sensor head end of the housing for positioning the sensor spaced from a ceiling of a room. The end housing the sensor may be angled for spacing the sensor from a wall on which the detector is mounted. All mounting, display control interaction and routine maintenance can be performed within easy reach, without climbing. The base has a power supply. A signal processor in the base is connected to the sensor head. Circuitry analyzes and processes signals, recognizing an alarm state and activating audible and visual alarms. Displays on the base, which are at user eye level, provide output of the signal processor. Buttons are provided on the base to test the detector and to cancel alarms. The buttons have distinct

visual and tactile indicators to differentiate them from one another. A drop flag attached to the base communicates with the sensor and persistently indicates the reduced power supply status within the detector. Several such smoke detector units (DU) are combinable with a remote output unit (ROU) communicating with the detector units.

Lalor, U.S. 5,983,551 describes a remote controlled apparatus and method for training retrieving and other hunting dogs and replaces all functions field assistants would normally perform during training. These functions include throwing multiple birds and retrieving dummies from different locations, in various directions and at various heights and angles, a gun shot sound, visual and audible assistance for the dog and protecting stored birds and retrieving dummies from the inexperienced dog. The apparatus is low in profile, lightweight and portable so that a single trainer can transport, setup and control the training procedure without the need of assistants. Numerous safety features have been developed which limit the possibility of accidental injury.

Backfisch, U.S. 6,155,177 describes a model railway system with improved banking characteristics comprising a series of track sections joined end-to-end to form a continuous track assembly and a modular trestle assembly to elevate the track assembly. The trestle assembly 32 includes a biaxially inclined coupling module that allows the track to be built at a greater incline within a tighter radius than would otherwise be possible. The model railway system includes a battery-powered locomotive with a portable hand-held remote control device 84 that uses infrared signals to send commands to the locomotive. The locomotive 110 pulls modular train cars that have coupling protrusions and beam support brackets to support accessories to build different types of cars.

Loudermilk et al., U.S. 6,185,851 describes a picture frame and accompanying audio message circuit is provided such that one or more desired audio messages stored in the audio message circuit associated with one or more display pictures can be played upon the touching of the pictures or the frame. When audio message playback is desired, a switch, on

the frame or under a protective cover for the picture, is activated by touching. Under CPU control, digital information representing the desired audio message is retrieved from a memory device, which is subsequently converted to an analog signal and transmitted to a speaker, which produces the desired audio message perceptible to a human. In other embodiments, multiple picture and multiple messages are provided such that the user can touch a particular picture, or the switch associated with that picture, and an audio message corresponding to the picture is then played through the speaker. In still other embodiments, a system is provided with a plurality of pictures mounted in the perimeter faces of a cube or other geometrical shape, each picture having associated with it a switch for activating a message or plurality of messages.

Jacobs et al., U.S. 6,275,170 describes a universal adaptor for use with electronic parking meters which provides these electronic parking meters with the ability to detect the presence of a parked vehicle and to adjust the position of the detector for accomplishing the vehicle detection, to gather statistics on the parking spaces and the meters, to alert the parking authority of meters that are expired in connection with vehicles still parked, and zeroing the remaining time off of any meter once the parked vehicle departs.

Carter, U.S. 6,283,220 describes a remote control vehicle comprising a body having a front end and a rear end and provided with first and second ground engageable propulsion means respectively disposed on opposite sides of the vehicle and in which the first and second propulsion means are driven by first and second transmission means respectively to permit the vehicle to be propelled and steered by driving the propulsion means on one side of the vehicle independently from the propulsion means on the other side of the vehicle, a boom assembly having carrying means for carrying an implement on the boom assembly, the boom assembly being mounted on the body for lifting movement between a raised position and a lowered position by a lifting means and wherein the ground engageable propulsion means and the lifting means of the boom assembly are operable by a receiver, of an electromagnetic signal, provided on the body.

Nebrigic et al., U.S. 6,483,275 describes a built-in battery integrated circuit in the form of a flexible circuit board of a consumer battery senses a voltaic cell electrode voltage, and when the voltage is indicative of a low state of charge, activates an indicating system, alerting a user to the impending battery failure. In addition, a tester actuator button is placed exteriorly on the battery container to manually activate the indicating system to verify that the battery has not become so low of charge as to prevent the indicating system from functioning. Advantageously, the tester actuator button may further enable the built-in battery integrated circuit, thus having all internal electronics unpowered until a user decides to use the battery. The indicating system includes an analog indicator such as a bargraph and/or a pulse indicator such as an LED or LCD.

Our prior art search with abstracts described above teaches a smoke detector and method using an elongated flexible low battery condition indicator member, a self-propelled golf bag cart, a universally acceptable smoke detector, a remote controlled apparatus and method for training retrieving dogs, a model train system with improved banking characteristics, a picture frame with associated audio messages, a universal adaptor for electronic parking meters, a remote control vehicle, and a consumer battery having a built-in indicator, but does not teach a remote-controlled vehicle with a low-power indicator configured to detect a low-power condition of the vehicle's power supply and alert the vehicle's operator of such through actuation of the low-power indicator. The present invention fulfills these needs and provides further related advantages as described in the following summary.

SUMMARY OF THE INVENTION

The present invention teaches certain benefits in construction and use which give rise to the objectives described below.

A vehicle and indicator apparatus generally comprises a remote-controlled vehicle, a power supply operably connected to the remote-controlled vehicle, a low-power indicator circuit operably connected to the power supply, and at least one low-power indicator operably connected to the low-power indicator circuit and configured to be enabled when a low-power condition is present. The remote-controlled vehicle may be any such vehicle operated by a remote controller, such as a land vehicle, a boat, or an aircraft. The power supply of the vehicle may be an electrical battery, an engine, or any other power supply utilized in remote-controlled vehicles. The low-power indicator may comprise a visible indicator and/or audible indicator mounted on the remote-controlled vehicle or on the controller itself. The visible indicator may be a mechanical device operably mounted on the remote-controlled vehicle such as a streamer device, a flag device, or a smoke device, or may be one of a number of other indicators such as an LED.

In use, an operator operates the remote-controlled vehicle through the remote controller, resulting in a decrease of the vehicle's power supply. This drop in power is monitored by the low-power indicator circuit. When a predetermined low-power condition of the power supply is detected, the low-power indicator is actuated to indicate low power of the power supply to the operator so that the vehicle may be safely guided back before all power is lost and the vehicle crashed or unrecovered. When the power supply is an electrical battery, the low-power indicator circuit monitors the operating voltage and compares it to a predetermined voltage range, such that the low-power indicator is actuated when the operating voltage falls outside of the desired operating voltage range. When an engine or other liquid fuel device serves as the power supply, the low-power indicator circuit instead monitors the fuel level and actuates the low-power indicator when a low-level condition is detected.

A primary objective of the present invention is to provide an apparatus and method of use of such apparatus that provides advantages not taught by the prior art.

Another objective is to provide such an invention capable of detecting a low-power condition in a remote-controlled vehicle and warning an operator of the vehicle of such condition through actuation of a low-power indicator.

A further objective is to provide such an invention capable of providing a visible low-power indicator selectively visible at a selected distance from the remote-controlled vehicle.

A still further objective is to provide such an invention capable of providing an audible low-power indicator selectively audible at a selected distance from the remote-controlled vehicle.

A yet further objective is to provide such an invention capable of selectively providing both a visible and an audible low-power indicator, either simultaneously or serially.

Other features and advantages of the present invention will become apparent from the following more detailed description, taken in conjunction with the accompanying drawings, which illustrate, by way of example, the principles of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings illustrate the present invention. In such drawings:

Figure 1 is a perspective view of an exemplary embodiment of the invention;

Figure 2 is an enlarged, partial sectional view thereof taken along line 2-2 of Fig. 1;

Figure 3 is a schematic view thereof;

Figure 4 is a reduced perspective view thereof showing the invention in use;

Figure 5 is a perspective view of another exemplary embodiment of the invention;

Figure 6 is an enlarged, partial sectional view thereof taken along line 6-6 of Fig. 5;

Figure 7 is an enlarged, partial sectional view of an alternate embodiment thereof taken along line 7-7 of Fig. 5;

Figure 8 is a reduced perspective view thereof showing the invention in use;

Figure 9 is a perspective view of still another exemplary embodiment of the invention in use;

Figure 10 is a schematic of still another exemplary embodiment of the invention; and

Figure 11 is a schematic of yet another exemplary embodiment of the invention.

DETAILED DESCRIPTION OF THE INVENTION

The above described drawing figures illustrate the invention in at least one of its preferred embodiments, which is further defined in detail in the following description.

The present invention is a vehicle and indicator apparatus **20** generally comprising a remote-controlled vehicle **30**, a power supply **40** operably connected to the remote-controlled vehicle **30**, a low-power indicator circuit **50** operably connected to the power supply **40**, and at least one low-power indicator **60** operably connected to the low-power indicator circuit **50** and configured to be enabled when a low-power condition of the vehicle **30** is present so as to alert an operator of the condition and allow the operator time to guide the vehicle **30** safely back. As will be appreciated by the discussion below, the components of the present invention may be operably connected through mechanical means or hard-wired or remote

electrical means, as the case may be. The low-power indicator circuit **50** may take many forms as are known in the art, as exemplified by the low battery condition warning indicators and operating circuits shown and described in United States Patent No. 5,053,752 to Epstein et al., hereby incorporated by reference in this specification. Moreover, though the incorporated reference is directed to a low battery condition circuit, it will be appreciated by those skilled in the art that similar circuitry may be employed in the low-power indicator circuit **50** of the present invention to detect low power in types of power sources other than batteries. As discussed in more detail below, in the exemplary embodiments, the low-power indicator **60** may be configured as a visible indicator, an audible indicator, or both and may be located on the remote-controlled vehicle **30** or on its controller **38**. Also, in the exemplary embodiments, the remote-controlled vehicle **30** is shown and described as a remote-controlled, or radio-controlled, model aircraft, though it will be appreciated by those skilled in the art that numerous other remote-controlled vehicles, such as boats and land vehicles, may be employed without departing from the spirit and scope of the present invention. Turning now to the first exemplary embodiment of Figs. 1-4, there is shown a remote-controlled vehicle **30** in which the at least one low-power indicator **60** comprises a visible, mechanical streamer device **62** mounted on the vehicle **30**. The streamer device **62** generally comprises a selectively-openable chamber **64** formed on the remote-controlled vehicle **30** and operably connected to the low-power indicator circuit **50** and at least one streamer **66** housed within the chamber **64** and attached on one end to the chamber **64** such that opening the chamber **64** under control of the low-power indicator circuit **50** releases the streamers **66** so as to stream behind the remote-controlled vehicle **30** and visibly indicate low power. The chamber **64** is configured in two halves, with a first half **68** being rigidly mounted on the vehicle **30** and a second half **70** being pivotably mounted on the first half about a hinge **72**. A clip **74** is formed on the second half **70** so as to extend through an opening **76** formed in a wall **32** of the vehicle **30**. The chamber **64** is operably connected to the low-power indicator circuitry **50** through a solenoid device **78** installed on the wall **32** adjacent to the opening **76** and equipped with a slidable catch **80** so that the catch may selectively engage the clip **74** under control of the low-power indicator circuit **60** and retain

the second half **70** of the chamber **64** in a closed position with the streamers **66** housed within the chamber **64**, as best shown in Fig. 2. The power supply **40** is shown as an electrical battery, though it will be appreciated that numerous other power supplies, both now known, such as a gasoline engine **44** as described below in connection with the alternative exemplary embodiment of Fig. 10, and later developed, may be employed in the remote-controlled vehicle **30** and monitored for low power according to the principles of the present invention. In the case of the electrical battery power supply **40**, the low-power indicator circuit **50** serves as a low-battery life indicator circuit operably connected to the battery, and the low-power indicator **60** serves as a low battery life indicator operably connected to the low-battery life indicator circuit so as to be deployed when the electrical battery has a low battery life. In the exemplary embodiment of the battery-type power supply **40**, it will be appreciated by those skilled in the art that the power supply **40** provides an operating voltage within a predetermined voltage range having a nominal voltage. Two such power supplies often used in radio-controlled aircraft and the like are a nominal 4.8 volt battery having an operating voltage range of 4.720 +/- 0.025 volts and a nominal 6.0 volt battery having an operating voltage range of 5.860 +/- 0.025 volts. The low-power indicator circuit **50** is configured to detect the operating voltage and to enable actuation of the low-power indicator **60** when the operating voltage falls outside the voltage range. The power supply **40** is electrically connected across terminals **42** to the other components of the vehicle **30** such as a central processor **34** and an on/off switch **36** and the low-power indicator **60** itself as required. The processor **34** may operate in conjunction with the low-power indicator circuit **50** to selectively control the low-power indicator **60**, as schematically shown in Fig. 4, though it will be appreciated that the low-power indicator circuit **50** may directly control the low-power indicator **60** without the cooperation of the processor **34**. The processor **34** also communicates with the remote controller **38** as is known in the art.

In use, an operator **120** operates the remote-controlled vehicle **30** of the vehicle and indicator apparatus **20** of the present invention through the remote controller **38**, resulting in a decrease of the vehicle's power supply **40**. This drop in power is monitored by the low-

power indicator circuit **50**. When a predetermined low-power condition of the power supply **40** is detected, the low-power indicator **60** is actuated to indicate low power of the power supply **40** to the operator **120** so that the vehicle **30** may be safely guided back before all power is lost and the vehicle **30** crashed or unrecovered. In the exemplary embodiment of Figs. 1-4, a battery-type power supply **40** is operably connected to the vehicle **30** and to the low-power indicator circuit **50**. The low-power indicator circuit **50** detects the operating voltage of the power supply **40** as the vehicle **30** is operated and compares the detected operating voltage to a desired voltage range as set in the low-power indicator circuit **50**. When the operating voltage is outside of the voltage range or is more than a preset cut-off percentage below the nominal voltage so as to cause a low-power condition, the low-power indicator circuit **50** controls the actuation of the low-power indicator **60** to signal the operator **120**. Again, the detection of the low-power condition and resulting actuation of the low-power indicator **60** may be controlled by the low-power indicator circuit **50** alone, through the processor **34** as shown schematically in Fig. 3, or through numerous other circuitry arrangements as are now known or later developed in the art to suit various remote-controlled vehicle **30** and power supply **40** arrangements. In the first exemplary embodiment, when the low-power condition of the power supply **40** is detected, the low-power indicator circuit **50** controls the solenoid device **78** to retract the slidable catch **80** in the direction of the arrow **82** to release the clip **74**. As a result, the second half **70** of the chamber **64** is freed to pivot about the hinge **72** in the direction of the arrow **84**, which pivoting is enabled by gravity, though it may be further enabled by a mechanical actuation device (not shown) such as a solenoid or servo motor. The pivoting of the second half **70** thus opens the chamber **64**, allowing the streamers **66** housed within the chamber **64** to extend from, or stream behind, the vehicle **30**, visibly alerting the operator **120** a distance away from the vehicle **30** of its low-power condition. Once the vehicle **30** has been safely landed in response to actuation of the low-power indicator **60** and the power supply **40** has been recharged or replaced or the vehicle **30** simply turned off, the low-power indicator circuit **50** resets, allowing the solenoid **78** to shift the catch **80** back to its extended position as shown in Fig. 2. The low-power indicator **60** is then reset by folding the streamers **66**

again within the chamber **64** and pivoting the second half **70** of the chamber **64** about the hinge **72** to snap the clip **74** over the catch **80** and close the chamber **64**. While the streamer device **62** is shown mounted on the underside of the vehicle **30**, it will be appreciated by those skilled in the art that any such visible indicator **60** may be mounted anywhere on the vehicle **30** that is convenient for alerting the operator of the low-power condition while not interfering with the operation of the vehicle **30**. It will be further appreciated that a virtually unlimited number of configurations of the chamber **64**, the streamers **66**, and the mechanical coupling of the chamber **64** to the control circuitry of the vehicle **30** is possible without departing from the spirit and scope of the present invention.

Turning now to Figs. 5-8, there is shown a second exemplary embodiment of the vehicle and indicator apparatus **20a** of the present invention. A remote-controlled vehicle **30'** is again provided as a model aircraft, but the visible, mechanical low-power indicator **60'** now comprises a flag device **86**. The flag device **86** comprises a staff **88** mounted on the bottom wall **32a** of the vehicle **30** so as to have a pivotable fixed end **90** and an opposite free end **92** and a flag **94** attached to the staff substantially at the free end **92** such that pivoting the staff **88** about the fixed end **90** under control of the low-power indicator circuit **50** extends the free end **90** away from the remote-controlled vehicle **30** so as to fly the flag **94** and visibly indicate low power to the operator **120**. In the second exemplary embodiment, as shown in section in Fig. 6, it will be appreciated that the cooperation of the low-power indicator circuit **50** with the solenoid **78** in response to a detected low-power condition of the power supply **40** again results in the shifting of the catch **80** to release a clip **74a** formed on the low-power indicator **60**, here the flag device **86**, and thereby allowing the low-power indicator **60** to be deployed to visibly signal the low power condition to the operator **120**. Again, once the clip **74a** is released, gravity alone causes the staff **88** of the flag device **86** to pivot about its fixed end **90**, unfurling the flag **94** as shown in Fig. 8. It will be appreciated that the flag device **86** may be mounted on numerous other locations on the vehicle **30** so as to be deployed under the power of gravity alone or in combination with a mechanical actuation device (not shown) so as to be selectively visible at a selected distance from the

remote-controlled vehicle **30**. Referring to Fig. 7, there is shown a related alternative exemplary embodiment of the low-power indicator **60** of the present invention comprising both a visible indicator and an audible indicator. The visible indicator is again configured as the exemplary flag device **86**, though it will be appreciated by those skilled in the art that the exemplary streamer device **62** described above, the exemplary smoke device **98** described below, or any number of other visible, mechanical low-power indicators may be employed in the present invention, and in the specific exemplary embodiment in which such a visible indicator is utilized in conjunction with an audible indicator, without departing from its spirit and scope. It will be further appreciated that while the audible indicator is shown and described as being used in conjunction with a visible indicator, it is also contemplated that the audible indicator may be employed as the sole low-power indicator **60**, without any other such indicator, visible or otherwise. In the alternative exemplary embodiment shown in Fig. 6, low-power indicator **60** is thus configured such that the visible indicator is, again, the flag device **86** as described above and the audible indicator is a speaker device **96**. The audible low-power sounds sent from the speaker device **96** may be any number of constant or intermittent alarms, tones, chirps or other such sounds that would be selectively audible to the operator **120** or others at a selected distance from the remote-controlled vehicle **30**. The low-power indicator circuit **50** is operably connected to the power supply **40** and both to the solenoid **78** for selective mechanical operation of the flag device **86** and to the speaker device **96**. In this way, when the low-power indicator circuit **50** detects a low-power condition of the power supply **40**, it is configured to selectively control the actuation of both the visible indicator, here, the flag device **86**, and the audible indicator, here, the speaker device **96**. In one exemplary mode of operation, the low-power indicator circuit **50** is configured to detect when the operating voltage of the power supply **40** is within a first outside range defined as outside the prescribed operating voltage range and no more than a preset, cut-off percentage below the nominal voltage and to enable actuation of the audible speaker device **96** when the operating voltage falls within the first outside range, and the low-power indicator circuit **50** is further configured to detect when the operating voltage is within a second outside range defined as more than the cut-off percentage below the nominal

voltage and to enable actuation of the visible flag device **86** when the operating voltage falls within the second outside range. The cut-off percentage below the nominal voltage can vary in the exemplary embodiments from 5% to 50%, but is preferably approximately 10%. That is, in a preferred embodiment of the present invention, the low-power indicator circuit **50** is configured to first actuate an audible indicator such as the speaker device **96** when the operating voltage of the power supply **40** falls outside the operating voltage range but no more outside this voltage range than 10% of the nominal voltage of the power supply **40**. Then, if operation of the vehicle **30** is continued and the power supply **40** is drawn down further to a point outside the operating voltage range greater than 10% from the power supply's nominal voltage, the low-power indicator circuit is then configured to actuate a visible indicator such as the flag device **86**. In an alternative exemplary mode of operation of the vehicle and indicator apparatus **20a** of the present invention, the low-power indicator circuit **50** is configured to detect when the operating voltage is within an outside range defined as more than a preset, cut-off percentage below the nominal voltage and to enable simultaneous actuation of the audible and visual indicators when the operating voltage falls within the outside range. For example, if the cut-off percentage was again selected to be approximately 10%, when the operating voltage of the power supply **40** is detected as being in the outside range, or more than 10% below the nominal voltage, the low-power indicator circuit **50** would actuate both the flag device **86** and the speaker device **96** to alert the operator **100** of this low-power condition. It will be appreciated by those skilled in the art that the indicators disclosed are merely exemplary of a variety of visible and audible indicators that may be employed alone or in combination in the low-power indicator **60** of the present invention. Moreover, a variety of operational set points and sequences of such indicators may also be employed without departing from the spirit and scope of the invention.

Referring now to Fig. 9, there is shown in use another exemplary embodiment of the vehicle and indicator apparatus **20b** of the present invention in which the remote-controlled vehicle **30b** is still configured as a model aircraft, but the visible, mechanical low-power indicator

60b now comprises a smoke device **98**. The smoke device **98** comprises a smoke source **100** formed on the remote-controlled vehicle **30b** and operably connected to the low-power indicator circuit **50** (Fig. 3) such that actuating the smoke source **100** under control of the low-power indicator circuit **50** releases smoke **102** from the smoke source **100** so as to emanate from the vehicle **30b** and visibly indicate low power. As with the exemplary streamer device **62** and flag device **86** embodiments of the low-power indicator **60**, the low-power indicator circuit **50** is operably connected to the power supply **40** so as to detect decreases in operating voltage, in the exemplary case of a battery-type power supply, and, based on a detected low-power condition, to actuate the smoke source **100** to again alert the operator **120** of the low-power condition. The smoke source **100** may be any device now known or later developed in the art for selectively generating a cloud or stream of smoke under the control of the low-power indicator circuit **50**, alone or in combination with a processor **34**. The smoke **102** may be colored or otherwise enhanced for visibility. As with the other visible, mechanical indicators, the smoke source **100** may be mounted anywhere on the vehicle **30b** so as to effectively emanate smoke upon a low-power condition while not adversely affecting the operation of the vehicle **30b**. The smoke source **100** may be rigidly mounted on the vehicle **30b** or configured so as to be selectively moveable on or retracted within the vehicle **30b**. Again, while the visible indicator has been shown and described in the various exemplary embodiments as either a streamer device **62**, a flag device **86**, or a smoke device **98**, it will be appreciated by those skilled in the art that a number of other visible, mechanical low-power indicators, such as LEDs, strobes, signs, banners, color changes, or other such visually perceptible indicators may be employed in the present invention without departing from its spirit and scope.

As shown schematically in Fig. 10, yet another exemplary embodiment of the vehicle and indicator apparatus **20c** of the present invention includes a power supply **40a** comprising an engine **44** and a tank **46** providing fuel (not shown) to the engine **44**. The engine may be any miniature combustion engine operating on a liquid fuel source, or other such device now known or later developed, and employed in the art of remote-controlled vehicles and the

like. The tank **46** is configured with a fuel gage **47** having a low-level setting. The low-power indicator circuit **50** is operably connected to the fuel gage **47** and is configured to enable actuation of the at least one low-power indicator **60** when the fuel in the tank **46** falls to the low-level setting. When such a low-level of fuel is detected, it will be appreciated that the low-power indicator circuit **50** will detect such low-power condition and actuate the low-power indicator **60** accordingly, as described more fully above. As with the other exemplary embodiments of the present invention, a variety of visible, audible and other indicators may be employed in alerting the operator **120** of the low-fuel condition of the remote-controlled vehicle **30c** without departing from the spirit and scope of the present invention. Turning to the schematic of Fig. 11, there is shown an exemplary embodiment of the present invention in which the low-power indicator **60a** is mounted on the controller **38a**. Because the controller **38a** is configured to enable remote control of the remote-controlled vehicle **30d** and so is held by the operator **120** during use of the vehicle **30d**, the low-power indicator **60a** need not be visible or audible from a distance. Even so, the low-power indicator mounted on the controller **38a** may be any of a number of visible or audible indicators described herein or known or later developed in the art for alerting an operator. The low-power indicator **60a** will again be under the control of low-power indicator circuit **50**, whether directly or as shown through a processor **34**, only the operable connection between the low-power indicator circuit **50** and the low-power indicator **60a** will now be achieved through remote-control, or radio-control, signals passing between the vehicle **30d** and the controller **38a**. In this way, the low-power indicator **60a**, though mounted on the controller **38a**, does not detect a low-power condition of the controller itself, but still of the remote-controlled vehicle **30d**. Therefore, in all the exemplary embodiments, the vehicle and indicator apparatus of the present invention is configured to detect a low-power condition of a remotely-controlled vehicle and generate a visible or audible signal alerting the operator of the low-power condition so that the operator may guide the vehicle to a safe location or cease operation of the vehicle so as to protect the vehicle and others from danger.

While the invention has been described with reference to at least one preferred embodiment, it is to be clearly understood by those skilled in the art that the invention is not limited thereto. Rather, the scope of the invention is to be interpreted only in conjunction with the appended claims and it is made clear, here, that the inventor(s) believe that the claimed subject matter is the invention.